

REMARKS

Reconsideration of this application as presently amended is respectfully requested. Applicant respectfully submits that the amendments to the claims are fully supported by the application as originally filed and that no new matter has been introduced thereby.

Claims 5, 7, 10, 21-27 and 30-32 have been objected to in various respects. In response, Applicant has amended claim 5 to delete “for” before “of”, has amended claims 7 and 21 to delete “(a) a”, has amended claim 10 to replace “may be is” with “is”, and has amended claim 22 to delete “(a) a” and to replace “(e)(c)” with “(c)”. Applicant has further amended claims 4, 6, 7, 19, and 20-24 to correct informalities as follows:

Claims 4 and 19 have been amended to replace “filter means” with “filter”. Claim 6 has been amended to delete “(a) a” and to replace “(b) an” with “an”. Claims 7, 21 and 22 have been further amended to replace “(b) an” with “an”. Claim 20 has been amended to replace “for of” with “of”. Claim 23 has been amended to replace “means a first noise generator” with “a first noise generator”. Claim 24 has been amended to replace “means a second noise generator” with “a second noise generator”.

Withdrawal of the objections to the claims is respectfully requested.

In addition to the above, Applicant has amended claim 1 to clarify that a filtering function for each signal path is determined based on a single selected function such that a product of the transfer function and the filtering function is the selected function; and the output signals from the signal paths are substantially equal with respect to phase or phase and magnitude. Applicant has amended claim 1 to replace “A method for” with “A method of”. Applicant has amended claims 16, 42 and 43 to make changes analogous to those of claim 1. Applicant respectfully submits that the amendments to claims 1, 16, 42 and 43 are supported by the application as originally filed at at least page 10, lines 23-24 and page 11, lines 2-23.

Claims 1-7, 10-11, 15-22, 28-29, 31 and 33-43 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Chabries (U.S. Patent No. 5,029,217) (“Chabries (217)”), in view of Chabries (U.S. Patent No. 4,658,426) (“Chabries (426)”).

The present application contains independent claims 1, 16, 42 and 43.

Various embodiments of the invention address unmatched signal paths, each having a microphone. According to claims 1, 16, 42 and 43, a transfer function of each signal path is identified. A filtering function for each signal path is then determined such that a product of the identified transfer function and the filtering function is a selected function. The selected function is common to the signal paths. Each filtering function is determined based on this single selected function. The filtering functions are applied to the signal paths, respectively. This makes the signal paths appear substantially identical. The output signals from a plurality of signal paths become substantially equal with respect to phase or phase and magnitude.

In contrast, Chabries (217) discloses a system for compensating for hearing loss that does not address unmatched signal paths. For compensating for hearing loss, Chabries (217) processes frequency domain signals obtained from one signal path (a single “input” of Figure 5).

The Office Action states that Chabries (217) discloses means for identifying a transfer function (Figure 5, 502, 504) for each of the signal paths. However, FFTs 502 and 504 of Chabries (217) are provided to frequency domain signals obtained from a single “input”. Chabries (217) neither discloses nor suggests a plurality of signal path, each of which has a microphone, and means for identifying a transfer function of each of the signal paths. Chabries (217) fails to suggest determining a filtering function for each signal path based on its identified transfer function and a selected function common to a plurality of signal paths.

When an input transducer is used in Chabries (217), the frequency response from the transducer must be equalized to unity by multiplying inverse gain factor of the transducer at the frequency of the corresponding spectral band (col. 6, lines 51 to 56). Namely, Chabries (217) compensates for hearing loss by applying gains to frequencies. Chabries (217) neither suggests nor teaches that the output signals from the signal paths are substantially equal with respect to phase.

With respect to claims 16 and 43, the Office Action states that Chabries (426) teaches the means (Figure 4, $Y_0(n)$, $Y_1(n)$,... $Y_{m-1}(n)$) identifying a transfer function of the signal path inherently (because, a microphone connected to a channel for picking up a signal from $X_0(n)$, $X_1(n)$... $X_{m-1}(n)$) including a microphone for each of the signal paths (Figure 4, $X_0(n)$, $X_1(n)$... $X_{m-1}(n)$, and col.6, line 39-col. 7, line 65). Chabries (426) is directed to an adaptive noise suppressor.

Figure 4 and col.6, line 39-col.7, line 65 of Chabries (426) disclose a noise cancellation system employed in an adaptive filter enhancer. Col. 6, lines 47-50 of Chabries (426) states that “n” is the sample index. Col. 6, line 62 of Chabries (426) states that “m” is reference channel number. Figure 4 of Chabries (426) is applied to a plurality of reference channel signals obtained from a single signal path. Chabries (426) does not address unmatched signal paths, each having a microphone.

With respect to claim 22, the Office Action addresses a propagation time delay of Chabries (426). Figure 2 of Chabries (426) discloses a noise cancellation system having a delay 76 and an adaptive filter 72. The adaptive filter 72 receives speech and noise signal from an input 74 through the delay 76. The delay 76 is chosen such that the noise components of the desired and reference inputs are uncorrelated with each other while the signal components remain correlated (col. 4, lines 46-52). Chabries (426) processes a delayed input for canceling noise. Chabries (426) does not use “delay” for matching a plurality of signal paths.

Even if Chabries (217) and Chabries (426) were combined, the resulting combination would not teach, suggest, or render obvious the subject matter as defined in claims 1, 16, 42 and 43. Hence it is respectfully submitted claims 1-7, 10-11, 15-22, 28-29, 31 and 33-43 are patentable in view of the cited references.

Claims 8, 12, 23 and 25-26 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Chabries (217) as modified by Chabries (426) as applied to claims 1-7 and 16-22, and further in view of Brainard, II (U.S. Patent No. 6,048,320) (“Brainard”). Claims 9, 12-13, 15, 24-25, 27, and 31-32 stand rejected under 35 U.S.C. 103(a) over Chabries (217) and Chabries (426) as modified by Brainard as applied to claims 1-8 and 16-23, and further in view of Belmonte (U.S. Patent No. 3,997,764) (“Belmonte”). Claims 14 and 30 stand rejected under 35 U.S.C. 103(a) over Chabries (217) and Chabries (426) as modified by Brainard and Belmonte as applied to claims 1-9 and 16-24, and further in view of Fang et al. (U.S. Patent No. 6,480,610) (“Fang”).

Brainard discloses an apparatus for measuring acoustic reflectance of an ear and the associated components in the apparatus. Brainard drives a transfer function of the inner ear. Brainard neither suggests nor teaches identifying a transfer function of each of the signal paths, where each signal path includes a microphone.

The Office Action states that Belmonte teaches that the first and second noise signals are a random noise signal (Figure 4, 14, 22 (pseudo-random noise)). The Office Action further states that Fang teaches a white noise signal (Figure 5, 583, (white noise generator), col.7, line 25-col.8, line 29). Belmonte merely discloses two pseudo random noise sources, while Fang merely discloses a white noise signal.


As described above, Chabries (217) and Chabries (426) do not teach, suggest, suggest or render obvious the subject matter as defined by claims 1, 16, 42 and 44. Brainard, Belmonte and Fang do not add any teaching Chabries (217), and Chabries (426) to render claims 8-9, 12-15, 23-27 and 30-32 unpatentable. Hence, it is respectfully submitted that claims 1-43 are patentable in view of the cited references.

In view of the above amendments and remarks, and having dealt with all of the matters raised in the Office Action, reconsideration and allowance of the application is respectfully requested.

Respectfully Submitted,

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